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(54) **Fiber treatment composition containing amine, polyol, functional siloxanes**

(57) A fiber treatment composition is disclosed. The composition contains siloxanes having amine, polyol functionalities. The composition provides good hand, resistance to yellowing and hydrophilicity to the fibers. The composition is preferably formulated as an aqueous emulsion. Applying the composition to textile fabrics produces treated fabrics having good hydrophilicity, good hand and resistance to yellowing.

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Description

[0001] The invention relates to a fiber treatment composition that provides the fiber with hydrophilicity, softness and resistance to yellowing. More particularly, this invention relates to a fiber treatment composition containing amine, polyol, functional siloxanes.

[0002] There is a growing need in the textile market for siloxane fabric softeners that not only provide softening but also impart hydrophilicity and other desirable properties to the treated fabric. Using a conventional siloxane polymer as the active ingredient in a fabric treatment agent often requires a trade-off in properties.

[0003] Amine-functional polysiloxanes are known to improve the hand of textiles. 'Hand' means the softness and smoothness of the textile. The hand of a treated textile is directly related to the amine content (e.g., the number of amino-functional groups) of the polysiloxane. Generally, as the amine content increases, the hand of the textile improves.

[0004] One method to produce amine-functional siloxane compounds for use as fabric treatment agents is to react an epoxy-functional silicone with an amine-functional organic compound. This method is described in U.S. Patent 4,409,267 which discloses a fabric treatment composition. The organopolysiloxane is prepared by a process comprising: 1) reacting a silanol-functional organopolysiloxane with a polyoxyalkylene compound and an epoxy-functional compound, by addition reaction and thereafter 2) reacting an amine compound with the epoxy group of the epoxy-functional organopolysiloxane, by addition or condensation reaction. The reactions are typically carried out in the presence of a solvent. The solvent and any impurities formed during reaction must then be removed. This method suffers from the drawback that unsubstituted amine groups can be present, which cause yellowing when the organopolysiloxane is applied to fabrics.

[0005] U.S. Patent 5,593,611 discloses a fabric treatment composition comprising an aminopolysiloxane. The aminopolysiloxane is prepared by hydrolyzing and condensing an amino-functional dialkoxysilane with water in the presence of heat and a base catalyst. The aminopolysiloxane is hydrophobic and has a molecular weight of at least 30,000.

[0006] U.S. Patent 4,757,121 discloses a fiber softening composition for synthetic fibers. The composition contains a combination of 2 different amino-substituted organopolysiloxanes, an epoxy-substituted alkoxysilane, and a monoepoxy compound. The first amino-substituted organopolysiloxane is terminated with a hydroxy group or alkoxy group that reacts with the epoxy-containing alkoxysilane. This forms a film of a crosslinked composition on the fiber surface. The second amino-substituted alkoxysilane is trialkyl-silyl terminated, and the second organopolysiloxane is prepared by reacting an amino-containing organopolysiloxane with a liquid organic epoxy compound.

[0007] U.S. Patent 4,680,366 discloses a fabric finishing agent containing an organopolysiloxane with primary and secondary amine-functional hydrocarbon groups and polyoxyalkylene groups. The organopolysiloxane can be emulsified in water and applied to fabric to provide softness and anti-static properties. The organopoly-siloxane is prepared by reacting a polyoxyalkylene glycidyl ether with an amino-functional organopoly-siloxane.

[0008] However, the amine-functional polyorgano-siloxanes suffer from the drawback that as the amine content of the polyorganosiloxane increases, the tendency of the textile to discolor or yellow increases. Additionally, the amine-functionality tends to impart hydrophobicity to the treated textile.

[0009] To minimize yellowing, it has been the practice in the textile industry to impart softness to a textile by applying a modified polysiloxane, which contains amide groups or carbamate groups instead of amine groups. However, amide and carbamate groups do not provide the same desirable level of softness characteristic of the amine groups.

[0010] For example, another method for producing amine-functional siloxanes for use in fabric treatment agents is disclosed in "Structure Activity Relationships of Aminofunctional Siloxanes as Components in Softening Finishes", *Textile Chemist and Colorist*, by Lautenschlager et al., published March 1995, Vol. 27, No. 3. Lautenschlager et al. disclose that epoxidation is not a viable alternative to an improved softener because of impurities formed during the reaction. Alternatively, Lautenschlager et al. disclose acylated aminofunctional silicones that can be used in fabric softening finishes, and a method for their preparation by acylation of an aminofunctional silicone fluid. The acylating agent can be an anhydride, lactone, or carbonate. However, the resulting acylated aminofunctional silicones exhibit a decline in hand when compared to standard aminosiloxanes.

[0011] Therefore, it is an object of this invention to provide a blend of siloxanes having amine and polyol functional groups in fiber treatment compositions.

[0012] U.S. Patent 5,277,968 discloses a process for treating a textile fabric. The process comprises applying an aqueous emulsion of a polydiorganosiloxane to the fabric. The polydiorganosiloxane has secondary and tertiary amine groups and hydroxyl groups.

[0013] U.S. Patent 5,118,535 discloses a method for treating fibrous materials comprising applying a composition containing a cyclic diamine functional polydiorganosiloxane. The composition can be a solution, dispersion or emulsion.

[0014] EP A2 0 399 706 discloses a method for treating fibrous materials. The method comprises pre-reacting an amine-containing organosiloxane with a monoepoxide, and thereafter applying the resulting product to the fibers. The product has primary, secondary and tertiary amine groups, where up to 10% of the amine groups are primary amine

groups.

[0015] U.S. Patent 4,311,626 discloses a composition containing an aminofunctional polydiorganosiloxane and a carboxylfunctional polydiorganosiloxane. The composition is used to treat fibers to impart smoothness, crease resistance, elongation recovery and compression recovery. However, carboxyl groups detrimentally affect the hand of the treated fibers.

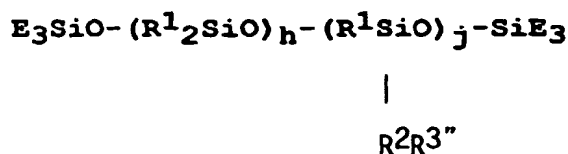
[0016] U.S. Patent 4,366,001 discloses a fiber treating composition that contains at least 2 or 3 types of organofunctional siloxanes. The first is an amino-functional siloxane, the second is a carboxyl-functional siloxane, and the third is an epoxy-functional siloxane. At least one of the organofunctional siloxanes contains at least one polyoxyalkylene group. The composition provides antistatic character, moisture absorbability, stain resistance, pliability, smoothness and compression recovery.

[0017] However, none of these references disclose a fiber treatment composition that imparts hydrophilicity and provides resistance to yellowing to textile fibers, without a detriment to hand. Therefore, it is a further object of this invention to provide a fiber treatment composition that provides all of these desired properties.

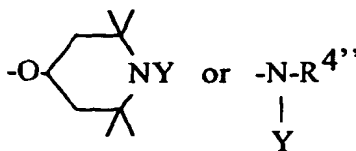
[0018] This invention relates to a fiber treatment composition containing siloxanes having amine and polyol functionalities. The combination of amine and polyol functionalities provides a synergistic effect in that the fiber treatment composition provides resistance to yellowing and provides hydrophilicity to the treated fiber without significant detriment to the hand of the fiber.

[0019] This invention relates to a fiber treatment composition. The composition comprises (a) an amine, polyol functional siloxane and (b) an epoxy, glycol functional siloxane.

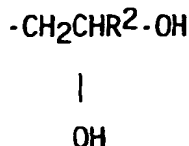
[0020] Component (a), the amine, polyol functional siloxane, has an average formula:



wherein each E is independently selected from a monovalent hydrocarbon group, a hydroxyl group or an alkoxy group; each R^1 is independently a monovalent hydrocarbon group; each R^2 is independently a divalent hydrocarbon group having 1 to 10 carbon atoms; h is 25 to 1,000; and j is 0.1 to 200. Each R^3 is a heterocyclic nitrogen-containing group



wherein each R^4 is independently selected from a hydrogen atom or a group of formula $-\text{R}^2\text{NY}_2$, each Y is independently a hydrogen atom or Y' , and each Y' is a group of the formula



wherein R^2 , which can be the same or different, is characterized as above, and with the proviso that not every Y is H.

[0021] Each E is an endblocking group independently selected from monovalent hydrocarbon groups, hydroxyl groups and alkoxy groups. The monovalent hydrocarbon groups suitable as endblocking group E are monovalent hydrocarbon groups, preferably alkyl or aryl groups. When the endblocking group E is an alkoxy group, it preferably has 1 to 15 carbon atoms.

[0022] Each R^1 is independently a monovalent hydrocarbon group. R^1 is exemplified by alkyl such as methyl, ethyl, propyl, butyl, pentyl and hexyl; aryl such as phenyl, tolyl and xylyl; and aralkyl such as benzyl and phenethyl. Alkyl groups are preferred and methyl is particularly preferred.

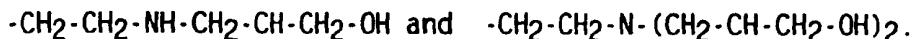
[0023] Each R^2 is independently a divalent hydrocarbon group of 1 to 10 carbon atoms. The divalent groups are exemplified by alkylene groups such as ethylene, propylene, butylene, isobutylene and methylpropylene; and alkylene-arylene groups expressed by the formula $-(CH_2)_2-C_6H_4$. Alkylene groups such as ethylene, propylene and isobutylene groups are preferred.

5 [0024] Preferably, R^1 is an alkyl group such as methyl, R^2 is an alkylene group such as isobutyl, h is 75 to 400, and j is 0.75 to 20.

[0025] Preferably, Y' is:



[0026] Preferably, $R^{4''}$ is selected from:



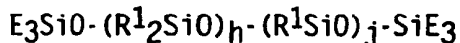
[0027] A preferred method to produce amine, polyol functional siloxanes is more fully disclosed in EP-A 0 399 706. This method comprises reacting an amine functional siloxane with an epoxy functional compound.

30 [0028] More preferably, (a) the amine, polyol functional siloxanes used in this invention are prepared by the following method. First, component (i) an amine functional siloxane is prepared by base equilibration using a catalyst. A preferred method comprises heating to $150^\circ C$., a composition comprising a polydiorgano-siloxane; an endblocker, such as hexamethyldisiloxane; an amine functional silane or amine functional siloxane; and water in the presence of the catalyst. While heating, a mild strip is applied to the system to remove by-products such as water and alcohol. After formation of component (i), the reaction mixture can be further stripped to remove low boiling impurities from component (i).

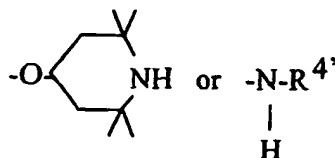
35 [0029] In a particularly preferred embodiment of the invention, component (i) is formed by a condensation reaction process. The condensation reaction process comprises I) heating a mixture comprising silanol-endblocked polydimethylsiloxane, an alcohol and an aminosilane, in the presence of a catalyst, and thereafter II) gradually reducing pressure to promote condensation polymerization by removing by-products from the reaction mixture.

40 [0030] The alcohol is preferably a blend of linear alcohols having 10 to 15 carbon atoms. Suitable alcohols are commercially available.

[0031] Component (i) the amine functional siloxane has the average general formula:



50 where R^1 , R^2 , h and j are as described above, with h preferably being from 75 to 400. R^3' is a heterocyclic nitrogen-containing group



where each $R^{4'}$ is selected from a hydrogen atom or a group of the formula $-R^2NH_2$.

[0032] When component (i) the amine-functional siloxane is prepared by the base equilibration process, each E is a monovalent hydrocarbon group, preferably an alkyl or aryl group. When the amine-functional siloxane is prepared by the condensation reaction process, each E is independently selected from monovalent hydrocarbon groups, hydroxyl groups and alkoxy groups.

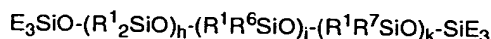
[0033] The amine-functional siloxane (i) is then reacted with (ii) an epoxy functional alcohol compound to form component (a) the amine, polyol functional siloxane, described above.

[0034] Component (ii) is an epoxy functional alcohol compound having a general formula:



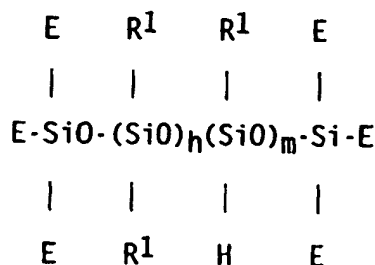
where R^2 is a divalent hydrocarbon group as described above. Suitable epoxy functional compounds for component (ii) include glycidol, 2,3-epoxy-cyclopentanol and 3,3-epoxy-6-methylcyclohexylmethanol. Glycidol is preferred.

[0035] Component (b) is an epoxy, glycol siloxane having the average general formula:



wherein each R^1 is independently a monovalent hydrocarbon group, R^6 is an epoxy containing group, R^7 is a polyether group, each E is independently selected a monovalent hydrocarbon group, a hydroxyl group and an alkoxy group, h is 25 to 1000, j is 0.1 to 200 and k is 0.1 to 200.

[0036] Component (b) is prepared, for example, by a hydrosilylation reaction of a composition comprising (1) a polyorganohydrogen siloxane, (2) an alkenyl-functional glycol ether, (3) an alkenyl-functional glycidyl ether, (4) a catechol compound and (5) a hydrosilylation reaction catalyst. Ingredient (1) above for Component (b) preferably has the general formula:



wherein E, R^1 , h, and j are as described above, and $m = j + k$. Preferably, ingredient (1) is a trimethylsiloxy-terminated, dimethyl-methylhydrogensiloxane.

[0037] Suitable alkenyl-functional glycol ethers, ingredient (2), are known in the art and are commercially available.

[0038] Ingredient (3) is an alkenyl-functional glycidyl ether. Ingredient (4) is a catechol compound. Suitable catechol compounds are known in the art and are commercially available.

[0039] Ingredient (5) is a hydrosilylation reaction catalyst. Suitable hydrosilylation catalysts are known in the art. For example, ingredient (5) may be any known platinum hydrosilylation catalyst.

[0040] In the textile treatment composition of the present invention component a) as defined above is preferably

present in an amount of 50 - 99 percent by weight, more preferred 80 - 98 percent by weight, most preferred 85 - 95 percent by weight and component b) as defined above is preferably present in an amount of 1 - 50 percent by weight, more preferred 2 - 20 and most preferred 5 - 15 percent by weight, all percentages are based on the total weight of component a) and b).

5 **[0041]** The textile treatment composition claimed herein may further comprise one or more optional components. For example, the following additional components may be added to our fiber treatment composition: (c) one or more surfactants, (d) an organic acid, (e) a carrier, (f) a thickener, (g), a crease resist resin, (h) an oil soluble colorant, (j) a water soluble colorant, (k) an organic fiber treatment compound, (l) an organosiloxane fiber treatment compound, and any combination thereof.

10 **[0042]** Component (c) is one or more optional surfactants selected from cationic or nonionic surfactants. Nonionic surfactants are preferred. Component (c) is added when the textile treatment composition is formulated as an emulsion. The amount of (c) is from 3 to 25 wt% of the emulsion.

[0043] The emulsion can further comprise optional Component (d), an organic acid. Component (d) is preferably glacial acetic acid. The amount of (d) ranges from 0 to 2 wt% of the total composition.

15 **[0044]** Component (e) is a carrier selected from water, organic solvents and silicone compounds. Suitable organic solvents include hydrocarbons such as aromatic hydrocarbons, exemplified by toluene, benzene and xylene; alkanes, such as hexane or heptane; ketones, such as acetone, methylethylketone and methylisobutylketone and alcohols. Component (e) is preferably water. Suitable silicone compounds include low number average molecular weight dimethylsiloxane containing fluids.

20 **[0045]** The textile treatment composition of this invention can be in any suitable form. For example, it can be applied to the textile neat. However, it can also be a solution, dispersion or emulsion. Preferably, our textile treatment composition is an emulsion comprising:

- 25 x) a discontinuous phase comprising component (a) an amine, polyol functional siloxane and component (b), an epoxy, glycol functional siloxane,
- y) a continuous phase comprising component (e), and
- z) component (c), one or more surfactants. Component (d), an organic acid, is preferably added to the emulsion.

[0046] The combined amounts of (a) and (b) in this emulsion is typically 2 to 80 wt%, preferably 10 to 30 wt% of the emulsion.

[0047] This invention further relates to a method for preparing a textile treatment composition. The method comprises combining components (a) and (b) with any of the above optional components. Typically, components (a) and (b) and any optional components are combined by a process selected from those of dissolving, dispersing and emulsifying.

[0048] Preferably, an emulsion comprising components (a), (b), (c) and (e) is prepared. A suitable method for the preparation of such an emulsion of an organopoly-siloxane is more fully disclosed in U.S. Patent 5,258,451.

35 **[0049]** The textile treatment composition herein is also prepared by independently combining (a) and (b) separately with optional components to form a plurality of treatment agents. The plurality of treatment agents are then combined before application to the textiles, or they are applied to the textiles simultaneously or even sequentially. For example, the claimed textile treatment composition herein can be prepared by forming (A) a first treatment agent comprising component (a) and component (e) and (B) a second treatment agent comprising component (b) and component (e). Preferably, the first treatment agent and the second treatment agent are both emulsions, component (e) is water and the first treatment agent further comprises one or more surfactants (c) while the second treatment agent also further comprises (c) one or more surfactants. Treatment agents (A) and (B) are then mixed together and thereafter applied to the textiles. Alternatively, treatment agent (A) can be applied to the textiles, followed by treatment agent (B). Contrastingly,

45 treatment agent (B) can be applied to the textiles, followed by treatment agent (1).
[0050] This invention further relates to a method for treating textiles. Our method comprises applying our textile treatment composition to the textile and thereafter removing (e) the carrier, if any. The textile treatment composition can be applied to the textile in any convenient method. For example, it can be applied by padding, dipping, spraying or exhausting. When the textile treatment composition comprises more than one solution, dispersion or emulsion; they are applied either simultaneously or sequentially to the textiles.

[0051] After the textile treatment composition is applied to the fabric, it is dried by heating.

[0052] The textile treatment composition can also be applied to the textiles during manufacture or later, such as during laundering the textiles. After application, any excess carrier can be removed by drying at ambient or elevated temperature.

55 **[0053]** The amount of our textile treatment composition applied to the textile is typically sufficient to provide 0.1 to 15 wt% of the combined weights of components (a) and (b) on the textile, based on the dry weight of the textile. Preferably, the combined amounts of (a) and (b) on the fibers is 0.2 to 1 wt% based on the dry weight of the textile.

[0054] The textiles that are treated with the textile treatment composition described above include natural fibers,

such as cotton, silk, linen and wool; regenerated fibers, such as rayon or acetate; synthetic fibers, such as polyesters, polyamides, polyacrylonitriles, polyethylenes and polypropylenes; and combinations or blends thereof.

[0055] The textile treatment composition of this invention provides several advantages over compositions known in the art. This invention surprisingly imparts both good hand and durable hydrophilicity to the treated textiles.

[0056] This invention further relates to a simple method for treating fibers. The method comprises applying our fiber treatment composition to the fibers and thereafter removing the carrier, if any. The fiber treatment composition is applied to the fibers by any convenient method, such as by padding, dipping or spraying. When the fiber treatment composition comprises more than one solution, dispersion or emulsion; it can be applied simultaneously or sequentially to the fibers.

[0057] The fiber treatment composition can also be applied to the fibers during manufacture, during fabric production or even later, such as during the laundering of the fabric. After application, the carrier is removed by drying at ambient or elevated temperatures.

[0058] The amount of fiber treatment composition applied to the fibers is typically sufficient to provide 0.1 to 15 wt% of the active ingredient on the fibers, based on the dry weight of the fibers. Preferably, the amount of active ingredient on the fibers is 0.2 to 1 wt%, based on the dry weight of the fibers.

[0059] The fibers that are treated with our claimed composition are not specifically restricted. Suitable fibers include natural fibers, such as cotton, silk, linen and wool; regenerated fibers, such as rayon or acetate; synthetic fibers, such as polyesters, polyamides, polyacrylonitriles, polyethylenes and polypropylenes; and combinations or blends thereof.

[0060] The form of the fibers is also not specifically restricted. Our fiber treatment composition is suitable for use on threads, filaments, tows, yarns, woven fabrics, knitted materials, nonwoven materials and the like.

[0061] The fiber treatment composition of this invention has the following unexpected advantages:

1. The composition imparts hydrophilicity to the fibers.
2. The composition provides yellowing resistance to the fibers.
3. The composition provides hydrophilicity and yellowing resistance without a significant detriment to the hand of the treated fibers. 'Hand' means the softness and smoothness of the fabric. The amine-functional groups are believed to provide superior hand to the fabric. The polyol and epoxy-glycol functionalities impart hydrophilicity and resistance to yellowing.

Reference Example 1

Emulsion samples were prepared by the following method.

[0062]

1. The active ingredient was combined with 2 surfactants and a first charge of acid, and this mixture was stirred for 5 - 10 minutes. The surfactants used were GENAPOL® UD 050 and GENAPOL® UD 110. GENAPOL® UD 050 and GENAPOL® UD 110 are ethoxylated C11 branched and linear alcohols having CAS No. 127036242, available from Hoechst Celanese. The acid was glacial acetic acid.
2. A first water charge was added to the mixture from step 1, and the resulting mixture was stirred for 30 minutes.
3. A second water charge was added to the mixture from step 2, and the resulting mixture was stirred for 30 minutes.
4. A third water charge was added to the mixture from step 3, and the resulting mixture was stirred for 30 minutes.
5. A second acid charge and a fourth water charge were added to the mixture from step 4. The resulting mixture was stirred for 30 minutes.

[0063] The formulation of the emulsion samples is in Table 1. The emulsion samples were formulated to provide 1 wt% of the active ingredient on the fabric to which the emulsion was applied.

Table 1

Emulsion Formulation	
Ingredient	Amount (Weight % based on total weight of the emulsion)
Active Ingredient	20
GENAPOL® DU 050	3

Table 1 (continued)

Emulsion Formulation	
Ingredient	Amount (Weight % based on total weight of the emulsion)
GENAPOL® DU 110	7
1 ST Acid Charge	0.1
1 ST Water Charge	4
2 ND Water Charge	4
3 RD Water Charge	41.9
4 TH Water Charge	19.8
2 ND Acid Charge	0.2

Reference Example 2 - Evaluation of Emulsion Samples

[0064] Each emulsion sample was then applied to 100% cotton interlock knit fabric (TESTFABRICS® style #460). The treated fabric was dried at 150°C. for 3 minutes. The treated fabric was then conditioned at room temperature overnight.

[0065] The whiteness index, hand and absorbency were then measured on each sample. Whiteness index is a dimensionless number computed from colorimetric data. Whiteness index was determined by averaging the results of 3 readings per sample with a HUNTERLAB® colorimeter, as described in ASTM E 313-96.

[0066] Hand is a relative measurement provided by a group of panel of experienced evaluators. Hand of each sample is ranked on a scale of 1 to X, X being the number of samples evaluated relative to each other. A rating of 1 indicates the best hand, i.e. softest and smoothest feel, and higher numbers indicate decreasing hand.

[0067] Absorbency is measured by AATCC (American Association of Textile Chemist and Colorist) Test Method 79-1995-Absorbance of Bleached Textiles. This method is: A drop of water is allowed to fall from a fixed height onto the taut surface of a fabric test specimen. The time required for the specular reflection of the water drop to disappear is measured and recorded as wetting time. Absorbency was measured after conditioning at room temperature overnight. In some examples, absorbency was measured again after aging the fabric 3 days later at 50°C. Representative samples are listed in Table 2 below.

Table 2 - Active Ingredient

Sample	Active Ingredient
B	$(\text{CH}_3)_3\text{SiO}((\text{CH}_3)_2\text{SiO})_{98}(\text{CH}_3\text{SiO})_2\text{Si}(\text{CH}_3)_3$ $\begin{array}{c} \text{CH}_2\text{CHCH}_2\text{NYCH}_2\text{CH}_2\text{NYCH}_2\text{CHCH}_2(\text{OH}) \\ \qquad \qquad \\ \text{CH}_3 \qquad \text{OH} \end{array}$ <p>where 50% of all instances of Y has the formula $-\text{CH}_2\text{CHCH}_2\text{OH}$, and 50% of Y is a hydrogen atom.</p>
C	$\text{ROSiO}((\text{CH}_3)_2\text{SiO})_{98}(\text{CH}_3\text{SiO})_2\text{Si}(\text{CH}_3)_3 \text{ OR}$ $\begin{array}{c} \text{CH}_2\text{CHCH}_2\text{NYCH}_2\text{CH}_2\text{NYCH}_2\text{CHCH}_2(\text{OH}) \\ \qquad \qquad \\ \text{CH}_3 \qquad \text{OH} \end{array}$ <p>where 75% of all instances of Y has the formula $-\text{CH}_2\text{CHCH}_2\text{OH}$, and 25% of Y is hydrogen</p>
D	Sample C as above + 4 wt % excess alkoxy endblocker

Examples

[0068] The following examples, as found in Tables 3 - 5 below, demonstrate the wettability, hand and whiteness index of the materials of the present invention. Various treatments were performed on cotton knit fabric.

Table 3

Wettability (units in seconds)			
Sample	1 Day	1 Wash	3 Days Aging at 50°C. (simulates 1 month at room temperature)
A	<1	0	1.0
B	1.0	1.0	3.7
C	<1	1.0	5.2
D	1.0	0	4.3
E	10.5	33.8	127.8
F	<1	0	2.0
G	<1	0	2.5
Control	0	0	0

For Tables 3 - 5:

[0069]

A: Emulsion of silicone quaternary functional siloxane and silicone polyether

B - D: See Table 2

E: Acylated aminofunctional silicone

F: 95 wt % Sample C + 5 wt % dimethyl-methylhydrogensiloxane reaction product allyl glycidyl ether and allyl (EO)(PO) methyl ether

G: 95 wt % Sample D + 5 wt % dimethyl-methylhydrogensiloxane reaction product allyl glycidyl ether and allyl (EO) (PO) methyl ether

Table 4

Hand (units an average of three readings)		
Sample	1 Day	1 Wash
A	3.9	1.2
C	4.4	3.3
E	4.5	5.0
F	4.5	3.6
Control	0	0

Table 5

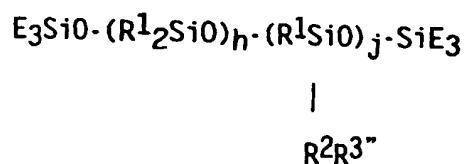
Whiteness Index (units an average of three readings)		
Sample	1 Wash	3 Days Aging at 50°C.
A	110.4	84.6
B	106.0	78.4
C	108.5	80.0
D	107.8	79.6
E	106.7	77.8
F	108.4	79.5
G	107.1	80.2
Control	109.7	85.9

[0070] As noted in the above tables, the addition of the epoxy glycol significantly improves performance stability on fabric with aging.

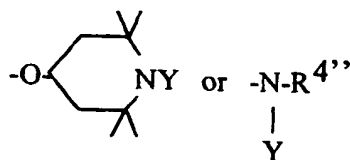
Claims

1. A fiber treatment composition comprising:

(a) an amine, polyol functional siloxane having an average general formula



wherein each E is independently selected from a monovalent hydrocarbon group, a hydroxyl group or an alkoxy group; each R^1 is independently a monovalent hydrocarbon group; each R^2 is independently a divalent hydrocarbon group having 1 to 10 carbon atoms; h is 25 to 1,000; j is 0.1 to 200; and each $\text{R}^{3''}$ is a heterocyclic nitrogen-containing group



wherein each $\text{R}^{4''}$ is independently selected from a hydrogen atom or a group of formula $-\text{R}^2\text{NY}_2$, each Y is independently a hydrogen atom or Y' , and each Y' is a group of formula



wherein R^2 , which can be the same or different, is characterized as above, and with the proviso that not every Y is H; and

(b) an epoxy, glycol siloxane having the average general formula $\text{E}_3\text{SiO}-(\text{R}^1_2\text{SiO})_h-(\text{R}^1\text{R}^6\text{SiO})_j-(\text{R}^1\text{R}^7\text{SiO})_k-\text{SiE}_3$, wherein each R^1 is independently a monovalent hydrocarbon group, R^6 is an epoxy containing group, R^7 is a polyether group, each E is independently selected from a monovalent hydrocarbon group, a hydroxyl group and an alkoxy group, h is 25 to 1000, j is 0.1 to 200 and k is 0.1 to 200.

2. The composition of claim 1 further comprising (e) a carrier to form an emulsion, a solution or a dispersion, and wherein ingredients (a) and (b) comprise 2 to 80 wt% of the resultant composition.
3. The composition of claim 2 further comprising (c) one or more surfactants and (d) an organic acid.
4. The composition of claim 2 wherein the carrier (e) is selected from water, organic solvents and silicone compounds.
5. The composition of claim 3 wherein the surfactant is selected from cationic or nonionic surfactants.
6. The composition of claim 3 wherein the organic acid is glacial acetic acid.
7. A method for treating textiles or fibers comprising applying thereto the composition of any of claims 1 - 6.
8. The method of claim 7 further comprising heating the treated textile or fiber to remove components (c), (d) and (e).
9. The method of claim 8 wherein said composition is applied to the textile or fibers in an amount sufficient to provide 0.1 to 15 wt% of ingredients (a) and (b) combined on the textile or fiber.
10. A treated fiber or textile obtainable by the method of any of claims 7 - 9.



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 00 11 8813

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Place of search MUNICH		Date of completion of the search 16 November 2000	Examiner Koegler-Hoffmann, S
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

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